Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

PRODUCTION, PRICES, AND AGGREGATE VALUES OF CROPS

THE prices of such commodities as cotton, wheat, and sugar are supposed to move upward, in general, when crops are small and to move downward when crops are large. The prices of these commodities are also subject to the underlying business forces which cause general prices to move with the business cycle. Which one of these two price tendencies for crops is the more important? In investigating this question we will consider the relation between, first, the volume of physical production of 12 leading crops of the United States and their prices, second, the volume of physical production and aggregate values. The figures for physical production, prices, and values by years for the period 1879–1920 are given in the accompanying table.

An examination of these figures shows that during the period 1879–96 the physical volume of crops produced in the United States rose steadily; on the other hand, the prices at which these crops were sold declined almost as constantly. Throughout the period 1897–1914 physical production of crops continued to increase, and their prices, reversing the movement of the preceding period, also moved upward. Thus we see that the long-time trend of crop production over these 35 years was a rising one, coincident with the growth of population[1] while the secular movements of agricultural prices showed the same characteristics as did those of the general price level, i. e., downward until 1896, then upward.

Our primary interest, however, is not in the long-time changes, but rather in the fluctuation within shorter intervals. Our next step, therefore, is to secure "corrected figures" by (1) eliminating the long-time movements, or secular trends, which have just been described, and (2) reducing the two sets of figures to comparable size.[2]

An examination of these corrected figures (see Chart I) clearly reveals the fact that those wave-like or cyclical movements which are characteristic of the changes in industrial and business conditions are not marked in either the prices or the physical production of crops. On the contrary, there are in the two latter series decided oscillatory tendencies. For the corrected figures, 1879–1914, there are out of a total of 34 cases, 23 in which the movements in crop prices for consecutive years are in opposite directions and 26 in which the fluctuations of the production index for consecutive years are in opposite directions.

INDEX OF PHYSICAL PRODUCTION, INDEX OF PRICES, AND RELATIVE AGGREGATE VALUES OF TWELVE LEADING CROPS IN THE UNITED STATES,* 1879–1920

(Arithmetic average for 1909–13 = 100)

Year	Index of physical production	Price index	Relative aggregate value	Year	Index of physical production	Price index	Relative aggregate value
1879	47.1	83.1	41.7	....	...	...	...
1880	51.0	86.6	46.1	....	...	...	...
1881	41.5	110.4	48.5	1901	71.8	85.3	63.5
1882	53.3	88.3	48.8	1902	91.4	72.0	67.4
1883	52.5	80.6	43.9	1903	84.4	80.2	68.6
1884	56.7	70.9	41.6	1904	93.3	80.2	75.6
1885	57.1	71.1	41.4	1905	94.5	78.4	74.9
1886	54.9	71.5	40.2	1906	100.5	77.7	78.5
1887	53.3	81.1	44.1	1907	90.4	94.4	86.9
1888	60.8	73.3	45.8	1908	95.5	94.2	91.5
1889	63.7	62.2	40.3	1909	95.0	103.1	99.1
1890	55.8	86.1	48.6	1910	99.1	96.4	96.1
1891	70.4	72.6	53.7	1911	94.1	103.5	98.7
1892	60.3	73.4	45.8	1912	111.0	90.6	101.0
1893	61.4	67.2	43.4	1913	98.2	106.4	105.1
1894	60.5	66.2	41.8	1914	108.5	93.6	105.4
1895	70.3	56.0	40.3	1915	113.4	97.8	114.7
1896	75.7	51.9	41.0	1916	100.4	148.5	150.6
1897	76.7	59.3	47.6	1917	108.5	202.8	224.2
1898	83.4	56.3	48.6	1918	107.1	213.9	234.1
1899	80.4	61.2	50.6	1919	110.6	230.1	259.4
1900	80.9	70.8	57.8	1920	116.0	131.9	165.5

* The crops included are: corn, cotton, hay, wheat, oats, white potatoes, sugar, barley, tobacco, flaxseed, rye, and rice. The prices and values used are in general farm prices or values as of December 1 of each year, transcribed directly from the *Yearbook* of the Department of Agriculture. Where farm prices or values were not available; as for sugar, 1879–1920, flaxseed, 1890–1901, rice, 1879–1903, and tobacco, 1897–98, annual values as of December 1 approximately were computed, and, in the case of the three crops last named, were adjusted to the farm values quoted for other years. The values for cotton were computed by multiplying the annual production by farm prices quoted in the *Yearbook*. The sources of the data employed in the construction of the physical production index are stated in the REVIEW for September 1920, pp. 249–253.

The indices for prices and for production were secured in each case by expressing the actual items of the constituent series as percentages of their respective arithmetic averages for 1909–13, and then taking weighted geometric means of these relatives, using as weights the average annual values of the various crops for the five-year period 1909–13. The index of physical production was published in the REVIEW for September 1920, p. 255.

The relative aggregate values were secured by expressing the total annual value of the crops in each year as a percentage of their average total value for 1909–13.

Chart I shows the striking inverse correlation of crop prices and production. It will be seen that in 30 out of the 34 years, prices and production moved in opposite directions. The degree of the inverse correlation between the year-to-year changes of the two series is expressed by the coefficient −.88[3] where a coefficient of −1.00 would indicate that the year-to-year fluctuations agreed perfectly, but were in opposite directions, and a

---

[1] For charts of the production index and for a comparison of the relative changes in agricultural production and in population, see the REVIEW for September 1920, pp. 255–256.

[2] The process employed is fully explained in the REVIEW for February 1920, pp. 40–41.

[3] The coefficient of correlation between the year-to-year differences of the original indices is slightly lower, numerically, being −.82. The correlation coefficient between the corrected figures is −.79, indicating that these figures have almost as close an inverse agreement as have their year-to-year differences.

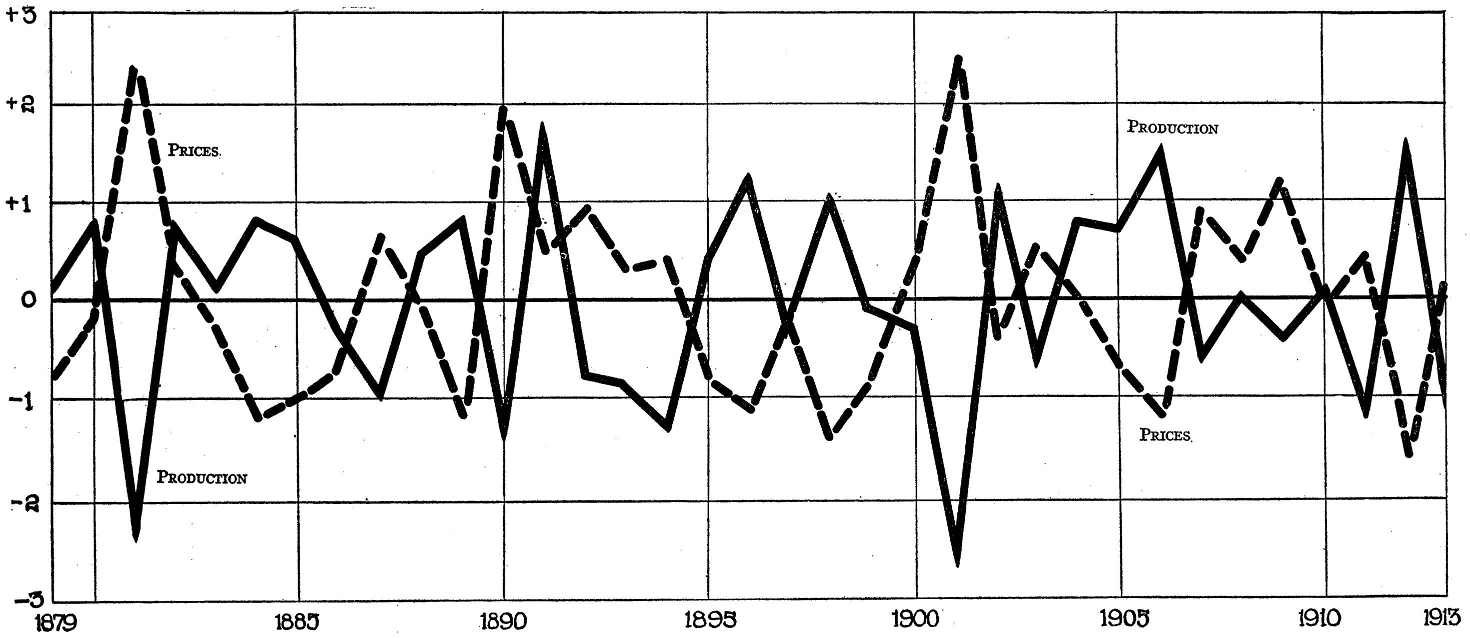

Chart I. — Comparison of Corrected Figures for Index of Physical Production of Crops and Index of Crop Prices

(The long-time movements, or secular trends, have been eliminated, and the two series have been expressed in comparable units.)

coefficient of +1.00 would indicate that the year-to-year movements agreed perfectly and were in the same direction.

In the *Quarterly Journal of Economics* for February 1921, p. 238, Professor Henry L. Moore presents indices of yield per acre for six leading crops whose combined values in 1919 constituted 90 per cent of the total value of the crops used in our index of production.[1] Thus, the data upon which Professor Moore bases his index are but little less extensive than those used by us. Although the methods of computation used in the two cases differ somewhat, it is worth while to compare the fluctuations of our index of crop production with those of Professor Moore's index of crop yield per acre (Chart II). Both series have been corrected by the elimination of long-time movement, or secular trend, and they have been expressed in comparable units.[2] In spite of the differences in the methods of computation of the two indices, the correlation between the corrected figures for production and yield is a very close one indeed; the coefficient is +.92, where it will be remembered + 1.00 would indicate perfect agreement. The correlation between the year-to-year changes is slightly higher, being +.95. These results show that there is a very close correspondence between the changes in yield per acre and those in total production; that is, it appears that the primary cause for changes in aggregate production are oscillations in the yields per acre.

The physical volume and the aggregate value of the 12 crops were uncorrelated during 1879–1914. In 18 cases, they moved in the same direction from year to

---

[1] The latter in turn constituted 79 per cent of the value of all crops produced.

[2] These units are the standard deviations, 1879–1913 and 1882–1913, respectively.

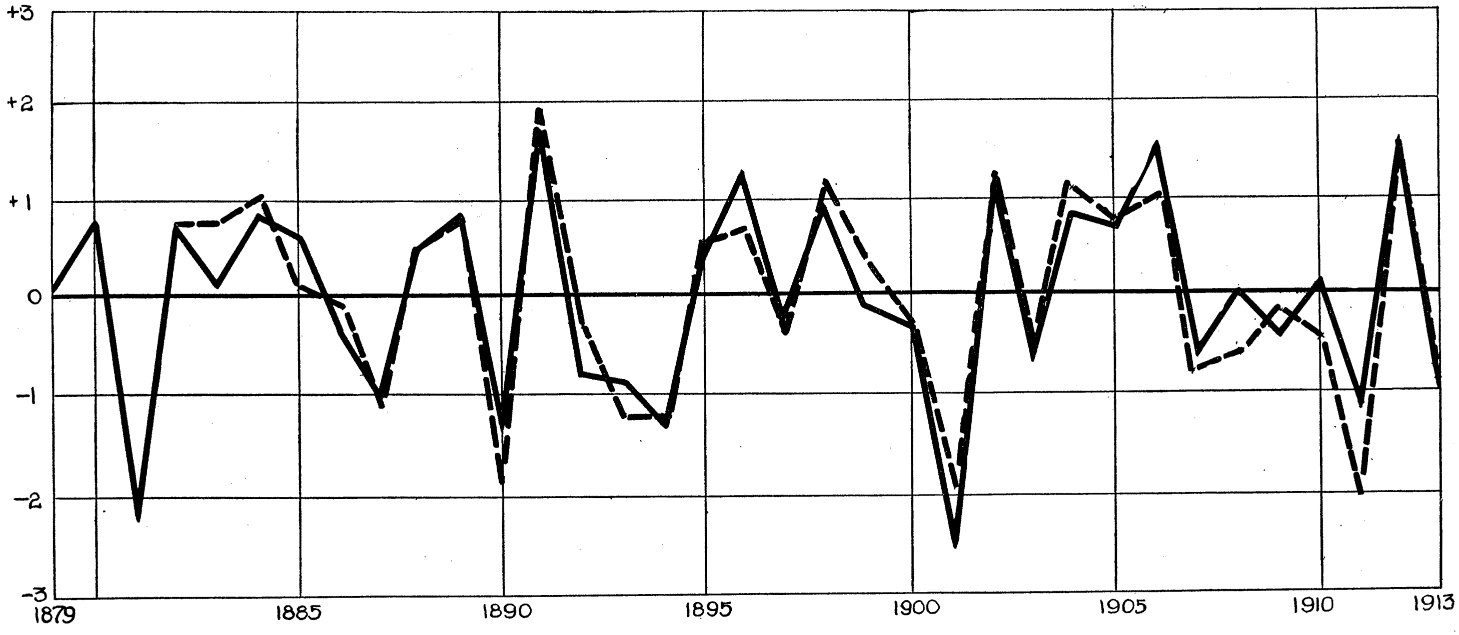

Chart II. — Comparison of Corrected Figures for Index of Physical Production of Crops (the Full Line) and Index of Yield per Acre of Crops (the Dotted Line)

(The long-time movements, or secular trends, have been eliminated, and the two series have been expressed in comparable units.)

year; in 17 cases, they moved in opposite directions. The degree of correlation is numerically expressed by the coefficient—.04, where 0 denotes lack of either direct or inverse correspondence.

The aggregate value of crops depends much more upon prices than upon the volume of crops; the year-to-year changes of index numbers of physical production and of value show agreement in direction for 21 out of 35 years, 1879–1914. The coefficient of correlation between these year-to-year changes is +.52, compared with −.04 for production and aggregate values.

We have found, then, that (1) the production and prices of agricultural commodities do not exhibit cyclical or wave-like movements such as appear in the changes of general business conditions and of the general commodity price level, but rather show oscillatory year-to-year fluctuations; (2) there is a very high correlation between the changes in yield per acre and those in total production of crops; (3) there is a close inverse agreement between the changes in the index numbers of crop prices and production; (4) the aggregate value of crops depends very much less upon variations in production than upon variations in prices.

COEFFICIENTS OF CORRELATION FOR PHYSICAL PRODUCTION, YIELD PER ACRE, PRICES, AND TOTAL VALUES OF CROPS

Series	Between first differences of actual indices	Between corrected figures *	Between first differences of corrected figures *
Physical production and yield per acre †	....	+.92	+.95
Physical production and prices ‡	−.82	−.79	−.88
Physical production and total values ‡	−.04	....	....
Prices and yield per acre †	....	−.69	−.83
Prices and total values ‡	+.52	....	....

* In the corrected figures the long-time trends have been eliminated.

† Based upon data for the period 1882–1914.

‡ Based upon data for the period 1879–1914.